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ABSTRACT

The attitudes and perceptions of practicing nurses, student nurses, and nurse educators toward computerization of health care were assessed using questionnaires sent to two general hospitals and five nursing education programs. The sample consisted of 83 first-year nursing students, 84 second-year nursing students, 52 practicing nurses, and 26 nursing faculty; the questionnaire response rate was 66%. Results fall into four general categories: perceived value of computers in health care; perceived effect of computers in nursing practice; attitude toward learning about computers in health care; and perceived factors which facilitate or hinder the implementation of computers. Although few of the respondents had experience with computers, a large majority believed they would have a profoundly positive effect on health care, particularly in more technologically-oriented areas, such as ICU/CCU, medical surgical, and emergency outpatient nursing. Most reported a desire for computer training, and three out of four practicing nurses believed a computer literacy course should be required in the nursing curriculum. Not surprisingly, financial considerations were identified as the number one factor to block the implementation of computers; however, nurses felt that a positive administrative attitude would facilitate this process. Further study which would group respondents according to age and/or nursing education is suggested. A four-page list of references and 15 data tables are provided. (JB)

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AN ASSESSMENT OF NURSING ATTITUDES TOWARD COMPUTERS IN HEALTH CARE

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PURPOSE OF STUDY

Computer technology is rapidly becoming a part of health care, and one of the primary groups to be affected by computer automation is nursing. Many opinions have been expressed in the literature--some authors suggest ways to facilitate nurses' acceptance of this innovation, while others speculate that the "human oriented" profession will not accept the idea of computer technology. Most of these points of view have not been supported by empirical data. The primary focus of this study is to assess the attitudes of practicing nurses, nursing faculty and nursing students toward the use of computers in the health care setting.

REVIEW OF LITERATURE

Nursing professionals have been writing about computer technology since the early sixties, with a significant number of articles written on the subject beginning in the mid-seventies. Even today, however, nursing journals do not publish a great deal on the subject--some journals dedicate only two articles per year to the topic of computers in nursing and health care (Grobe, 1985). The majority of the literature deals with five main areas of computer usage in relation to nursing and health care: 1) client data gathering functions, 2) educational applications, 3) administrative/management uses, 4) clinical practice applications, and 5) research functions. (See the bibliography for citations concerning each of these areas). These are, of course, important topics of study; however, few nursing research studies deal with questions regarding the potential implications for users of automation in health care--the human factors.

Schwartz (1984) identifies human factors, which are perceptual and attitudinal in nature, that can be categorized as follows: 1) apprehension/confidence level, 2) perception of usefulness of technology, and 3) user motivation. Throughout the nursing literature may be found "opinion articles" that discuss these human factors in terms of how nursing should approach the introduction of computer technology into health care, or that offer predictions of how nurses will respond to the computerization process. These articles approach the subject from an experiential basis--the opinions are rarely based upon empirical data. The following examples are typical of most "human factors" literature in nursing (Anderson, 1984; Zielstroff, 1976; Tate, 1975; Waterstradt, 1981):

a) Careful planning is essential when implementing change; ownership of the computerization plan will facilite acceptance.

b) Open lines of communications must be maintained.

c) A sense of urgency and commitment must be conveyed to facilitate automation by maintaining a forward momentum.

d) Group work is essential in developing a sense of ownership regarding the adoption of automation.

e) A formalized orientation program must be planned and offered for all nursing staff members and for new employees.

Another area of the literature concentrates on more abstract and theoretical aspects, such as conflict that occurs with change of any kind and strategies that aid in coping with these changes. Tate (1975) cites three types of conflict that can occur with computer automation--those that: 1) stem from differing goals and incompatible perceptions/values/beliefs, 2) reflect struggles regarding the allocation of resources such as funding, equipment, power, status, and 3) relate to perceived threats to one's identity as part of a group. Tate's suggested strategies for coping with changes related to computerization are useful for both the individual staff nurse and the nurse administrator. The recommended strategy includes collecting the facts, understanding the nature and dynamics of the system, developing assertiveness skills and strategies, confronting the issue, compromising and negotiating resolution, and finally, "refreezing"--dealing with relationships that have been strained in the process.

Mixed predictions and reviews are found regarding the responses of nurses to computer automation. Frank (1964) speaks of depersonalization and other dangers that the "technotronic" age can bring, while reassuring the reader that nurses need not be fearful of being replaced by computers. Another author deals with "computer cowardice" among nurses and offers educational solutions to miminize the effect (Grobe, 1984). Two of the few empirical studies on nursing attitudes toward computerizaton in health care present a very different point of view. Norwood, Hawkins and Gall (1976) found that 94% of their respondents indicated a favorable view regarding the use of computers in health care. Krampf and Robinson (1984) reported the following attitudes of nurses toward computers: 79.5% feel that they will gain satisfaction from learning to use a computer, 90.4% believe that if nursing informaton is automated nursing productivity and effectiveness will be increased, and 87.7% indicated a willingness to attend staff development programs on computers.

A review of the literature regarding how nurses will respond to computerization or how nursing leaders should introduce the computer automation process in health care settings shows a wealth of personal opinions and personal experiences, but a dearth of quantifiable data. Little empirical information is available that compares perceptions and attitudes toward computerization; that which does exist evaluates primarily the practicing nurse and does not address the attitudes of nursing students and faculty. One primary goal

of the present study is to assess the attitudes and perceptions of practicing nurses, student nurses, and nurse educators toward computerization of health care in general, and its impact on the profession of nursing in particular. The following research questions were formulated:

1) What is the perceived value of computers in health care?

2) What is the perceived effect of computer automation on nursing practice?

3) What are nurses' attitudes toward learning about computers?

4) What factors are perceived as enhancing or inhibiting the process of computerization in health care?

DEFINITION OF TERMS

Attitude--an individual's feeling, position, orientation, or opinion toward a topic, subject or event.

Nurse educators--facuty members currently teaching in a nursing education program (all faculty must be licensed and have completed masters or doctoral degree preparation).

Nursing students--first and second year students enrolled in two year nursing education programs.

Perception--an individual's thought, understanding, or cognition relevant to a topic, subject or event.

Practicing nurses--registered nurses (diploma, A.D., B.S., and M.S. prepared) employed in general hospital settings.

METHODOLOGY

Questionnaires were sent to nursing personnel at two general hospitals, nursing educators at three associate degree schools of nursing, and student nurses at two associate degree nursing programs. Agencies participating in the study did not have hospital information systems or computer assisted instruction programs in operation at that time. Each participant was asked to respond to a series of twenty questions. Demographic information included age, sex, level of education, previous experience in health care delivery, and previous use of computers in the health care setting. Additional questions assessed the participants' views regarding the usefulness of the computer and the effect it may have on nursing and health care. Anonymity was maintained throughout the study--the identities of individuals who participated were not revealed and only group data were analyzed. The sample size

was 83 first year nursing students, 84 second year nursing students, 52 practicing nurses, and 26 nursing faculty. Ten percent of the respondents were male; this reflects the national demographic trend of male representaton in the profession. Not all participants responded to all of the questions; for this reason, the actual number of data vary from question to question. The questionnaire response rate was 66%. Statistical analyses were performed using Chi square, cross tabulations and frequencies.

RESULTS

The results of the study fall into four general categories. These categories are: perceived value of computers in health care, perceived effect of computers on nursing practice, attitude toward learning about computers in health care, and perceived factors which facilitate or hinder the implementation of computers.

A. Value of Computers in Health Care

The first category deals with some basic attitudes that professional and pre-professional nurses have toward computers in the health care system. Specific questions assess previous experience with computers, and the perceived effect of this technology on health care.

Table 1. QUESTION: HAVE YOU HAD PREVIOUS EXPERIENCE WITH COMPUTERS IN A HEALTH CARE FACILITY?

	Previous experience (%)		
	No experience	Experience	TOTAL
Students	70.1	29.9	100
Practicing nurses	64.2	35.8	100
Nursing faculty	30.8	69.2	100

Chi-square = 15.2
** $p < .0005$

The data indicate that most of the respondents have not had experience with computers in a health care facility. However, it appears that nursing faculty have had this background as part of their professional experience. Just under 70% of the nursing faculty had worked with computers as compared to approximately a third of the nonfaculty personnel.

Table 2. QUESTION: DO YOU THINK THAT COMPUTERS WILL AFFECT HEALTH CARE?

	Potential effect (%)		
	Will affect	No affect	Total
Students	97.0	3.0	100
Practicing nurses	94.3	5.7	100
Nursing faculty	100	0	100

Chi-square = 1.87
$p < 0.39$

The response to this question is an overwhelming, "Yes, computers will affect health care in the future." Few of the participants disagree with this concept. There is no significant difference in responses among the members of the three groups.

Table 3. QUESTION: IF COMPUTER TECHNOLOGY DOES AFFECT HEALTH CARE, DO YOU BELIEVE THAT ITS INFLUENCE WILL BE POSITIVE OR NEGATIVE?

	Positive/negative influence (%)		
	Positive	Negative	Total
First year students	100	0	100
Second year students	97.6	2.4	100
Practicing nurses	94.1	5.9	100
Nursing faculty	100	0	100

Chi-square = 6.00
$p < .11$

Once again, the participants agree. The influence of computers will be positive. While a few responses were negative, it is clear that the great majority of nurses and nursing students feel that computers have something positive to add to health care.

B. Effect of Computers on Nursing Practice

The next category of questions deals with the general impact of computerization on nursing, and the specific areas of nursing which would be affected by the introduction of computer technology into the health care setting.

Table 4. QUESTION: DO YOU THINK THAT COMPUTERS COULD HELP YOU PERFORM YOUR NURSING DUTIES MORE EFFECTIVELY?

	Effectiveness (%)		
	More effective	Less effective	Total
First year students	93.7	6.3	100
Second year students	89.0	11	100
Practicing nurses	86.5	13.5	100
Nursing faculty	96.2	3.8	100

Chi-square = 3.11
$p < .38$

Members of each group strongly agree that computers would specifically aid nursing personnel in performing their nursing duties. This perception of the use of computers indicates that a few of the respondents seem to believe that computers will affect other components of health care more positively than it will nursing.

Table 5. QUESTION: WHICH NURSING SPECIALTY DO YOU BELIEVE WOULD BE MOST DIRECTLY AFFECTED BY THE INTRODUCTION OF COMPUTER TECHNOLOGY INTO THE HEALTH CARE SYSTEM?

Specialty	Frequency	Percent
ICU/CCU	78	34.2
Medical/surgical	51	22.4
Emergency/outpatient	46	20.2
Other specialty	23	10.1
Community health	15	6.6
Rehabilitation/extended care	12	5.2
Obstetrics/gynecology	2	.9
Psychiatric/mental health	1	.4
Pediatrics	0	0.0

Table 6. QUESTION: WHICH NURSING SPECIALTY DO YOU BELIEVE WOULD BE LEAST DIRECTLY AFFECTED BY THE INTRODUCTION OF COMPUTER TECHNOLOGY INTO THE HEALTH CARE SYSTEM?

Specialty	Frequency	Percent
Psychiatric/mental health	53	23.6
Community health	48	21.3
Rehabilitation	46	20.4
Emergency/outpatient	26	11.6
Obstetrics/gynecology	18	8.0
Other specialty	16	7.1
Pediatrics	7	3.1
ICU/CCU	6	2.7
Medical/surgical	5	2.2

The specialty which nurses believe would be most affected is the highly technologically oriented ICU/CCU. Conversely, nurses believe that the psychiatric/mental health specialty would be least affected. The trends displayed in tables 5 and 6 suggest that nurses think specialties such as ICU/CCU and medical/surgical nursing, which currently use a large amount of technology, will continue to be affected by new technologies, and that the less technological specialities such as mental

health, community health, and rehabilitation will not be affected quite as strongly. The attitude reflected in these responses seems to be that those specialities currently using technology will increasingly be expected to work with computers and those specialities not currently involved will not be as dramatically affected.

Table 7. QUESTION: WHICH NURSING ROLE DO YOU BELIEVE WOULD BE MOST AFFECTED BY THE INTRODUCTION OF COMPUTER TECHNOLOGY INTO THE HEALTH CARE SYSTEM?

Role	Frequency	Percent
Staff nurse	91	38.2
Nurse researcher	56	23.5
Director of nursing/ supervisor	23	9.7
Head nurse	23	9.7
Office nurse	17	7.1
Nurse educator	8	3.4
Nurse practitioner	7	2.9
Clinical nurse specialist	7	2.9
Other role	6	2.5

Table 8. QUESTION: WHICH NURSING ROLE DO YOU BELIEVE WOULD BE LEAST AFFECTED BY THE INTRODUCTION OF COMPUTER TECHNOLOGY INTO THE HEALTH CARE SYSTEM?

Role	Frequency	Percent
Office nurse	74	31.9
Nurse educator	38	16.4
Staff nurse	37	16.0
Director of nursing/ supervisor	27	11.6
Nurse practitioner	19	8.2
Other role	15	6.5
Nurse researcher	9	3.9
Clinical nurse specialist	7	3.0
Head nurse	6	2.6

These data indicate that the two nursing roles which are perceived as being most affected by the computer are those of the staff nurse and the nurse researcher. When asked which nursing roles would be least affected, the respondents place office nurses and nurse educators at the top of the list.

C. Learning About Computers in Health Care

The third category of responses deals with perceptions of the survey participants regarding computer courses, and the respondents' willingness to take computer courses either as part of formal nursing education or as an inservice activity.

Table 9. QUESTION: DO YOU THINK THAT TO USE A COMPUTER EFFECTIVELY YOU NEED A STRONG MATH BACKGROUND?

	Math background (%)		
	Necessary	Not necessary	Total
First year students	18.3	81.7	100
Second year students	13.3	86.7	100
Practicing nurses	5.7	94.2	100
Nursing faculty	0.0	100.0	100

Chi-square = 8.83
* $p < .03$

This question indicates a difference in attitude among the four groups. While the great majority of participants do not believe that a strong math background is necessary, the data indicate that the student responses differ significantly from those of the nursing faculty and practicing nurses. More students hold the belief that math is important in using computers in a nursing setting, while none of the faculty and only a few practicing nurses agree.

Table 10. QUESTION: HOW WOULD YOU FEEL ABOUT TAKING A COURSE IN "COMPUTERS IN NURSING?"

	Students	Practicing	Faculty	Total
Confident	39.5	54.7	40.0	42.9
Comfortable	37.7	32.1	48.0	37.6
Neutral	13.8	5.7	4.0	11.0
Somewhat Uncomfortable	4.8	3.8	4.0	4.5
Apprehensive	4.2	3.8	4.0	4.1

NSD df=8

Table 11. QUESTION: SHOULD A COURSE IN COMPUTER LITERACY (USE OF COMPUTERS IN HEALTH CARE) BE REQUIRED FOR NURSING STUDENTS?

	NO	YES
Students	47.9	52.1
Practicing Nurses	24.5	75.5
Faculty	38.5	61.5

** $p < .01$ df=2

Table 12. QUESTION: SHOULD A COURSE IN COMPUTER LITERACY BE OFFERED AS AN ELECTIVE FOR NURSING STUDENTS?

	NO	YES
Students	11.0	89.0
Practicing Nurses	32.6	67.4
Faculty	16.7	83.3
TOTAL	15.8	84.2

** $p < .01$ df=2

Table 13. QUESTION: IF A COLLEGE COURSE OR CONTINUING EDUCATION OFFERING IN COMPUTER LITERACY WERE AVAILABLE, WOULD YOU ENROLL IN IT?

	NO	YES
Students	11.7	88.3
Practicing Nurses	9.6	90.4
Faculty	12.5	87.5
TOTAL AVERAGE	11.3	88.7

NSD df=2

Tables 10 - 13 present some interesting data. Most nurses are not afraid to enroll in a course in computer literacy. In fact, 80.5% of the respondents indicate that they would feel comfortable or even confident about taking such a course; only 4.1% express a feeling of apprehension. When asked if a course in computer literacy should be required for all nursing students, practicing nurses, nurse educators, and students nurses disagree significantly. The students are about evenly divided in their opinions; however, three of every four practicing nurses believe that a course should be required. Nurse educators support the idea at a ratio of two to one. Table 12 presents a seemingly contradictory situation. While

students and faculty groups support the idea of having a computer course as an elective, the response rate of the practicing nurses falls from 75.5% (required) to only 67.4% (elective). Apparently, practicing nurses feel that knowledge of the use of computers in health care is sufficiently important that a computer literacy course should not be an optional matter, but rather that all new nurses should have a background in the subject. Table 13 indicates that all three groups of respondents would be interested in enrolling in a college or continuing education course in computer literacy. Appoximately 89% of the sample say that they will enroll if given the opportunity.

D. Factors Affecting Implementation of Computers

The final category of items deals with factors which facilitate or inhibit the introduction of computer technology into the health care setting.

Table 14. QUESTION: WHAT DO YOU BELIEVE WOULD BE THE MAJOR FACTOR IN BLOCKING THE IMPLEMENTATION OF COMPUTERS IN HEALTH CARE?

Factor	Frequency	Percent
Financial considerations	137	56.2
Nursing staff attitudes	48	19.7
Administration attitudes	33	13.5
Medical staff attitudes	20	8.2
Other factor	6	2.5

Table 15. QUESTION : WHAT DO YOU BELIEVE WOULD BE THE MAJOR FACTOR IN FACILITATING THE IMPLEMENTATION OF COMPUTERS IN HEALTH CARE?

Factor	Frequency	Percent
Administration attitudes	110	46.0
Financial considerations	57	23.9
Nursing staff attitudes	36	15.0
Medical staff attitudes	27	11.3
Other factors	9	3.8

Nurses identify the major obstacle to the implementation of computers in health care as the lack of money. This factor is followed by the attitudes of nursing staff. They also believe the major factor which could facilitate the implementation of computer technology to be a positive administrative attitude, and to a lesser degree an adequate supply of money.

DISCUSSION AND IMPLICATIONS

The results of this study are categorized into four general groups. The first of these categories is the perceived value of computers in the health care system. Although few of the respondents to the questionnaire have had previous experience with computers, they believe that this technology will have a profound effect on health care and that this effect will enhance the quality of health care. The second category examines how respondents perceive the effect of computerization on nursing practice. The opinion of the nurses is that they expect the more technologically oriented specialities to be most affected. Specialities such as ICU/CCU, medical surgical, and emergency outpatient nursing are expected to be most dramatically affected while the traditionally "human oriented" specialities like psychiatric/mental health nursing and community health nursing will be least affected. Two nursing roles are expected to be most affected by computers. Staff nurses and nurse researchers are at the top of the "most affected" list. This result is not particularly surprising since these two roles are now using computers in a number of hospital and university settings. However, the three roles believed to be least affected are office nurse, nurse educator, and once again staff nurse. The fact that the role of staff nurse is mentioned toward the top of each list indicates that some disagreement exists regarding the full impact on this particular nursing role. The third category of responses deals with the nurses' attitudes toward learning more about computers. Apparently the majority nurses do not suffer from a pronounced sense of cyberphobia. Most of the respondents indicate that they are not afraid of this emerging technology, and express a strong desire for learning more about the subject; they also strongly encourage nursing education to include a course on computer literacy in the nursing curriculum. These data suggest that leaders in the process of computer automation need not spend as much time as previously thought in "preparing nursing personnel to accept the computer." Rather time should be devoted to designing courses and implementing plans to effectively teach the nursing staff to use computers. The final category of responses deal with those factors which nurses believe will enhance or hinder the implementation of computers. As might be expected, financial considerations is identified as the number one factor to block the implementation of computers. Money is always a major consideration when introducing costly innovations. When asked which factors would most facilitate the implementation of computers, nurses indicate

that a positive administrative attitude is most important. This implies that strong central administration support of computerization can have a significant, positive influence in the automation of a health care unit.

Replication of this study is recommended to validate the findings recorded here. Further study could also include data from respondents grouped according to formal nursing preparation (e.g. diploma, associate degree, baccalaureate, masters, and doctorate), to determine how formal education influences nurses' perceptions of computer automation in health care. An examination of attitudes and perceptions of various age groups regarding computer automation might also yield interesting and useful results. Reviewing data from these varied respondents could guide the nurse educator or nurse administrator who is planning for computerization and is considering the needs of the professionals or pre-professionals who will be affected by this process. Data comparing pre-computerization and post-computerization perceptions and attitudes of nurses could be useful in evaluating the impact of changes undergone, and the effectiveness of plans and strategies implemented. Such results may assist nurse administrators and educators when planning for the future technological advancements that are inevitable.

CONCLUSION

Throughout the literature may be found references discussing how nurses should approach the introduction of computer technology into the health care setting, and how nurses will respond to computer automation. Unfortunately, few hard data are available to support these claims. This study provides an empirical background. Among the findings of this study are the following: nurses are accepting, not opposing computer technology in the health care setting; nurses perceive the influence of computers on nursing and health care to be positive; nursing curricula should provide educational preparation in computer technology; continuing education offerings will be well-received by nursing; and nurses identify a strongly positive orientation by adminstrators as facilitating the computerization process in health care. Finally, these empirical data indicate a willingness among nurses to enter the information age with a progressive, positive orientation and with preparedness.

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